Site: Pear	**Overall Confidence Rating: Medium**

Background: A total of 70,530 acres are planted in pears in the United States. Organophosphate pesticides (OP) represent 55.6% of all insecticide usage on this crop with an average of 2.8 applications per year. Analysis of OP usage was conducted for two regions; 1) California and 2) Pacific Northwest (Washington and Oregon). These 2 regions reflect 92.6 % of pear production in the United States and 96.8% of production. Analysis was conducted over data available for the years 1994 - 1996.

Organophosphate Pesticides	% Treated		# Applications		Rate (lb AI/A)		PHI (days)	
	Max	Avg	Max	Avg	Max	Avg	Min	Avg
azinphos-methyl	80.0	75	NS		3.1		15	
chlorpyrifos	13.0	8.0	1/1 yr	1.0	3.0	2.1	NS	
diazinon			NS		5.0		21	
dimethoate	10.0	5.5	NS		2.0		28	
malathion	4.0	1.0	NS	1.0	--	1.0	1	
methyl parathion	14.2	7.0	NS		2.0		NS	
phosmet			NS		5.0		NS	

Confidence Rating: H= high confidence = data from several confirming sources; confirmed by personal experience
M = medium confidence = data from only a few sources; may be some conflicting or unconfirmed info.
L = low confidence = data from only one unconfirmed source

Pests Targeted by Organophosphates in California	
Major	Mites (European Red, Twospotted Spider, Pacific Spider, McDaniel Spider, Brown, Pearleaf Blister) and Codling Moth
Moderate	-none-
Minor	Scale (San Jose and Italian Pear) and Aphid (Green Peach, Bean, and Melon (Cotton))

Major = 20+% of all OP usage on pest; Moderate = 5-20% of all OP usage on pest; Minor =<5% of all OP usage on pest

Pests Targeted by Organophosphates in the Pacific Northwest (Washington and Oregon)	
Major	Codling Moth and Mealybug (Grape)
Moderate	Mites (European Red, Pearleaf Blister, Twospotted Spider, Pear Rust, McDaniel Spider,and Brown) Pear Psylla, Bugs (Tarnished Plant, Bill, Stink, Red, and Lygus), and Aphid (Green Apple)
Minor	-none-

Major = 20+% of all OP usage on pest; Moderate = 5-20% of all OP usage on pest; Minor =<5% of all OP usage on pest

Sources:

1. Proprietary EPA market share information.
2. QUA+ - Oregon. 1997.
3. QUA+ - Washington 1997.
4. Integrated Pest Management for Apples & Pears. 1991. University of California. Publication 3340.
5. Pacific Northwest 1998 Insect Control Handbook. 1998. Oregon State University.
6. Orchard Pest Management: A Resource Book for the Pacific Northwest. 1993. Good Fruit Grower, Yakima, Washington.
7. 1998 Crop Protection Guide for Tree Fruits in Washington. 1998. Cooperative Extension Washington State University. Publication EB0419.
8. Integrated Pest Management for Apples & Pears. 1991. University of California, Statewide IPM Project. Publication 3340.
9. Pear Pest Management Guidelines. 1995. University of California, Davis, UCPMG Publication 16.
10. The All-Crop, Quick Reference Insect Control Guide (1997), Meister Publishing Company.
11. Label Use Information System (LUIS) Version 5.0, EPA.

Date: 8/6/98

Site: Pears
Region: Pacific North (WA and OR)

Pest[2, 3, 4, 5, 6]	Organophosphate[1, 2, 3, 4, 5, 6]	Efficacy[2, 3, 6]	Mkt[1]	Class	Alt. Pesticide List[1, 2, 3, 4, 5, 6]	Efficacy[2, 3, 6]	Mkt[1]	Constraints of Alternatives[2, 3]
Timing: **Pre-Bloom**								
Mealybug	azinphos-methyl	❍ - ☺	—	O	Petroleum oil	---	---	There are no registered alternatives to OP's for Pre-bloom control of Mealybug.
(Major)	diazinon	❍	High					
Mites (European Red, Pear Leaf Blister, Two spotted spider, Pear Rust, McDaniel, and Brown)	azinphos-methyl	---	---	C	oxamyl	● - ❍	---	Efficacy of insecticides varies widely in relation to the mite species targeted.
	chlorpyrifos	---	Mod	P	esfenvalerate	---	---	
	diazinon	---	Lo	CH	endosulfan	---	Mod	Carbamates and pyrethroids may cause explosion of mite populations as a result of disruption of biological control.
	methyl parathion	---	—	B	Bacillus thuringiensis	---	---	
				O	abamectin	---	Mod	
(Moderate)				O	chinomethionate	---	High	Clofentezine should not be applied after tight cluster stage.
				O	clofentezine	---	---	
				O	fenbutatin oxide	---	---	Hexythiazox should not be applied after pink stage.
				O	formetanate hydrochloride	---	---	
				O	hexythiazox	---	---	Increased use of oil alone Pre-bloom will result in tree damage.
				O	insecticidal soap	---	—	
				O	petroleum oil	❍ - ☺	---	
				O	sulfur	----	Lo	

Pest Importance: Major = 20+% of all OP usage on pest; Moderate = 5-20% of all OP usage on pest; Minor = <5% of all OP usage on pest
Efficacy Rating: Excellent = ☺ Good = ❍ Fair = ●
Market Share: High = use of OP represents 20+% of all insecticide usage on pest; Med = 5-20% of all usage on pest; Lo = <5% of all usage on pest
Insecticides: C = Carbamates; P = Pyrethroids; CH = Chlorinated Hydrocarbons; IGR = Insect Growth Regulators; B = Biological; O = Other pesticides

Site: Pears
Region: Pacific North (WA and OR)

Pest[2, 3, 4, 5, 6]	Organophosphate[1, 2, 3, 4, 5, 6]	Efficacy[2, 3, 6]	Mkt[1]	Class	Alt. Pesticide List[1, 2, 3, 4, 5, 6]	Efficacy[2, 3, 6]	Mkt[1]	Constraints of Alternatives[2, 3]
Timing: **Pre-Bloom**								
Pear Psylla (Moderate)	chlorpyrifos	---	Lo	P	esfenvalerate	● - ☺	Lo	The Pre-Bloom program for Pear Psylla is important in preventing unmanageably high populations later in the summer. Permethrin should only be applied with oil and should be applied only between dormant and prepink stage only. Increased use of oil alone Pre-bloom will result in tree damage.
	diazinon	---	Lo	P	permethrin	● - ☺	—	
				CH	endosulfan	❍ - ☺	Mod	
				O	abamectin	---	Lo	
				O	chinomethionate	---	High	
				O	petroleum oil	● - ❍	Mod	
				O	sulfur		Lo	
Bugs (Tarnished Plant, Bill, Stink, Red, and Lygus) (Moderate)	chlorpyrifos	● - ❍	Lo	P	esfenvalerate	☺	---	OP usage is in combination with oil. Only pyrethroids provide significant residual control, but may cause mite flare ups. Other materials may have to be applied more than once. Increased use of oil alone Pre-bloom will result in tree damage.
	diazinon	● - ❍	High	P	permethrin	☺	—	
	dimethoate	—	—	CH	endosulfan	● - ❍	---	
				O	formetanate hydrochloride	---	—	
				O	petroleum oil	---	—	

ADDITIONAL INFORMATION:

Pear production in the Pacific North (OR and WA) represents 58.8% of national acreage (bearing) and 57.9% of production. OP's represent 11.8% of all pesticides used during the Pre-Bloom period on pears in the Pacific North. There are no alternatives to OP's for Pre-Bloom control of Grape Mealybug and European Red Mite. Insect growth regulators (tebufenozide, fenoxycarb and pyriproxifen), Spinosad, and pyridaben are not currently registered for use in pear but may be effective against some pests. In addition, imidacloprid is effective against Pear Psylla and Grape Mealybug but is not registered for use Pre-Bloom.

Pest Importance: Major = 20+% of all OP usage on pest; Moderate = 5-20% of all OP usage on pest; Minor = <5% of all OP usage on pest
Efficacy Rating: Excellent = ☺ Good = ❍ Fair = ●
Market Share: High = use of OP represents 20+% of all insecticide usage on pest; Med = 5-20% of all usage on pest; Lo = <5% of all usage on pest
Insecticides: C = Carbamates; P = Pyrethroids; CH = Chlorinated Hydrocarbons; IGR = Insect Growth Regulators; B = Biological; O = Other pesticides

Site: Pears
Region: Pacific North (WA and OR)

SOURCES:

1. Proprietary EPA market share information.
2. QUA+ - Oregon. 1997.
3. QUA+ - Washington 1997.
4. Integrated Pest Management for Apples & Pears. 1991.
5. Pacific Northwest 1998 Insect Control Handbook. 1998. Oregon State University.
5. Orchard Pest Management: A Resource Book for the Pacific Northwest. 1993. Good Fruit Grower, Yakima, Washington.
6. 1998 Crop Protection Guide for Tree Fruits in Washington. 1998. Cooperative Extension Washington State University. Publication EB0419.
7. The All-Crop, Quick Reference Insect Control Guide (1997), Meister Publishing Company.
8. Label Use Information System (LUIS) Version 5.0, EPA.

Date: 8/6/98

Pest Importance: Major = 20+% of all OP usage on pest; Moderate = 5-20% of all OP usage on pest; Minor = <5% of all OP usage on pest
Efficacy Rating: Excellent = ☺ Good = ❍ Fair = ●
Market Share: High = use of OP represents 20+% of all insecticide usage on pest; Med = 5-20% of all usage on pest; Lo = <5% of all usage on pest
Insecticides: C = Carbamates; P = Pyrethroids; CH = Chlorinated Hydrocarbons; IGR = Insect Growth Regulators; B = Biological; O = Other pesticides

Site: Pears
Region: Pacific North

Pest[2, 3, 4, 5, 6]	Organophosphate[1, 2, 3, 4, 5, 6]	Efficacy[2, 3, 6]	Mkt[1]	Class	Alt. Pesticide List[1, 2, 3, 4, 5, 6]	Efficacy[2, 3, 6]	Mkt[1]	Constraints of Alternatives[2, 3]
Timing: **Post-Bloom**								
Codling Moth (Major)	azinphos-methyl	☺	High	C	carbaryl-	●	Lo	
	chlorpyrifos	—	Lo	P	esfenvalerate	—	—	
	diazinon	●	—	P	permethrin	—	—	
	dimethoate	●	—	B	azadirachtin	---	Lo	
	methyl parathion	☺	Lo	B	Bacillus thuringiensis	—	—	
	phosmet	❍ - ☺	High	O	petroleum oil	---	—	
				O	sulfur	---	—	
Pear Psylla (Moderate)	azinphos-methyl	●	Mod	P	esfenvalerate	—	Lo	
	chlorpyrifos	—	—	P	permethrin	—	Lo	
	diazinon	---	Lo	CH	endosulfan	—	Lo	
	phosmet	● - ❍	Lo	O	abamectin	☺	High	
				O	amitraz	❍	Lo	
				O	chinomethionate	—	Lo	
				O	imidacloprid	❍ - ☺		
				O	petroleum oil	---	Mod	
Aphid (Green Apple) (Moderate)	azinphos-methyl	●	High	CH	endosulfan	●		
	diazinon	● - ❍	---					
	dimethoate	● - ❍	Mod					
	phosmet	●	High					

Pest Importance: Major = 20+% of all OP usage on pest; Moderate = 5-20% of all OP usage on pest; Minor = <5% of all OP usage on pest
Efficacy Rating: Excellent = ☺ Good = ❍ Fair = ●
Market Share: High = use of OP represents 20+% of all insecticide usage on pest; Med = 5-20% of all usage on pest; Lo = <5% of all usage on pest
Insecticides: C = Carbamates; P = Pyrethroids; CH = Chlorinated Hydrocarbons; IGR = Insect Growth Regulators; B = Biological; O = Other pesticides

Site: Pears
Region: Pacific North

ADDITIONAL INFORMATION:

Pear production in the Pacific North (OR and WA) represents 58.8% of national acreage (bearing) and 57.9% of production. OP's represent 59.1% of all pesticides used during the Post-Bloom period on pears in the Pacific North. Diazinon is not effective against Codling Moth in Washington and is also no longer effective against Aphids in some areas. It is suggested that methyl parathion not be used against Codling Moth until the second cover spray. Dimethoate application may cause russeting of the Anjou pear variety. Mating disruption is an alternative for Codling Moth control but will not be an equally efficacious replacement. Insect growth regulators (tebufenozide, fenoxycarb and pyriproxifen), Spinosad, and pyridaben are not currently registered for use in pear but may be effective against some pests.

SOURCES:

1. Proprietary EPA market share information.
2. QUA+ - Oregon. 1997.
3. QUA+ - Washington 1997.
4. Integrated Pest Management for Apples & Pears. 1991. Pacific Northwest 1998 Insect Control Handbook. 1998. Oregon State University.
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